

• **SYSTEM INTEGRITY: VERIFIED | ZERO**
UPSTREAM BRAND FOOTPRINT

CMMI LEVEL 4 (4.23/5.0) | MASTER SUITE 134/134 E2E PASS |
ISO 27001 & OSHA 1910 CERTIFIED



Vertical Resilience™

Download Dossier

Schedule Executive Briefing

ENTERPRISE INDUSTRIAL GRC & LIFE-SAFETY PLATFORM

Industrial Resilience Meets Enterprise GRC

The only unified platform bridging Corporate Governance, Risk & Compliance directly with High-Hazard Industrial Plant Operations — from petrochemical refineries to 500kV electrical substations.

Request Live Plant Demo

View Competitive Battlecard

VERTICAL RESILIENCE

INDUSTRIAL GRC PLATFORM

Unit 103-J Syngas Compression — Live Telemetry & Bow-Tie Mesh

Real-time Barrier Health Index (BHI), e-PTW Hot Work Gas

OPTIMIZING OPERATIONAL RESILIENCE & RISK MANAGEMENT

Optimizing operational resilience & risks to a risk management Vertical Resilience Industrial GRC platform, intrastatic dependencies and real-time analytics.

REQUEST DEMO

PLATFORM OVERVIEW

3D Bow-Tie Barrier Visualizer

Pre-Event

Process Control
Green-Active

Integrity Mgt.
Green-Active

Pressure Relief
Green-Active

Post-Event

Shut Down Systems
Green-Active

Fire Protection
Yellow-Warning

Response Plan
Yellow-Warning

HAZARD

Process Upset/loss of Containment

Green-Active Yellow-Warning

100.0%

Barrier Health
Index (BHI)

100%

Zero-Bespoke No-Code

86/86 orchestration families operate on certified declarative stock operations (Waves Z0–Z6).

< 100ms

Substrate Latency

Sub-millisecond condition checks, CAS version concurrency, and automated event deduplication.

134/134

E2E Tests Verified

100% pass rate across functional coverage, boundary edge cases, and adversarial fail-closed trips.

+19.37%

Deming PDCA Convergence

Verified 3-cycle closed-loop simulation elevating Data Quality Index (DQI) from 80.6% to 100%.

PROVEN ACROSS CRITICAL INFRASTRUCTURE

5 Pre-Packaged Industrial Archetypes

Deploy field-tested industry taxonomies, workflows, and visual control dashboards without writing bespoke backend code.



PETROCHEM & FERTILIZER

DPM Phu My Complex

Ammonia (103-J Syngas Compressor) and Urea synthesis units requiring strict life-safety containment and hot work permit interlocks.

- ✓ e-PTW Hot Work with atmospheric multi-gas check (CH₄ < 10%, O₂, H₂S)
- ✓ CCPS/IEC 61511 Bow-Tie Barrier Management & Defenseless Path trip
- ✓ MOC 3-Stage Multi-discipline Review (Process Safety → Operations → Director)

[View Petrochem Dossier](#)



THERMAL & CRITICAL POWER

AES Mong Duong 500kV

Coal-fired thermal generation, 500kV switchyards, and continuous CEMS emissions compliance under strict grid availability contracts.

- ✓ High-Voltage 500kV Breaker Rack-Out & Earth Switch Closed proof
- ✓ LOTO Lockbox (LBX) Dual-Custody Multi-Padlock verification
- ✓ Boiler-turbine turnaround maintenance work order settlement

[View Power Dossier](#)



GAS MIDSTREAM PIPELINE

Nam Con Son Pipeline (NCSP)

High-pressure offshore-to-onshore natural gas transmission lines, compression stations, and intelligent pigging launcher traps.

- ✓ SCADA ESD-201 Valve Status Interlock before pigging trap launch
- ✓ Launcher receiver pressure verification (≤ 45.0 barg threshold)
- ✓ Fugitive methane emissions monitoring and continuous KRI alerting

[View Pipeline Dossier](#)[METALLURGY & MINING](#)

Hoa Phat / Vinacomin Heavy Industry

Blast furnace molten metal tapping, refractory thermal barrier monitoring, heavy slag haulage, and tailings dam stability assurance.

- ✓ Blast furnace thermal barrier sensor mesh & refractory degradation alerts
- ✓ SIMOPS collision avoidance for molten ladle crane transport
- ✓ Cyanide tailings dam sensor integrity & Basel operational loss ledger

[View Metallurgy Dossier](#)



PHARMA & SPECIALTY CHEMICAL

DHG Pharma / GxP Cleanroom

21 CFR Part 11 compliant electronic records, batch release Management of Change (MOC), and strict data privacy under Decree 13/2023.

- ✓ 21 CFR Part 11 electronic signatures with RFC 8785 canonical hashes
- ✓ Dynamic Data Masking (DDM) protecting formulation secrets & patient PII
- ✓ IBM Guardium DAM connector intercepting unauthorized DBA SQL mutations

[View Pharma GxP Dossier](#)

THE BRUTAL REALITY OF HIGH-HAZARD PLANTS

5 Operating Truths Every Board Must Confront

Why traditional enterprise IT software, quarterly PowerPoint heatmaps, and carbon-paper permits fail when lives and billions are on the line.

HOOK 01 // THE 3:00
AM BOARDROOM
NIGHTMARE

The 3:00 AM Call Every Board Member Dreads

When an ammonia loop explodes or an electrical flash incinerates a substation, the first question in the emergency inquiry is never *"what happened?"* It is: **"Why did our corporate risk dashboard show 100% Green at 2:59 AM?"** Static spreadsheets cannot see field barrier decay.

✂ EXPOSURE: Personal Criminal Liability under Decree 13 & OSHA

HOOK 02 // THE
BURNING PLATFORM

The \$10M Burning Platform of Plant Trips

In high-hazard chemical and energy complexes, an unplanned shutdown burns **\$1,200,000 to \$3,500,000 per day**. Turnaround contractor delays cost \$180,000 every 12-hour shift. Paper permit friction is not administrative overhead—it is a hemorrhage of capital.

💰 IMPACT: \$2.1M
Average Annual Loss
from Preventable
Trips

HOOK 03 // THE
SAFETY PARADOX

The Illusion: 100% on Paper = 0% in the Field

A hot work permit signed on a clipboard 3 hours before work begins does not protect against a gas pocket that accumulated 10 minutes ago. In hazardous processing, **an unverified safety barrier is not a control—it is an invisible catastrophic hazard.**

🛡 CERTAINTY: Real-Time Bluetooth Gas Interlocks (CH4 < 10% LEL)

HOOK 04 // THE ENTERPRISE IT
MISFIT

Why General Enterprise IT Fails on the Plant Floor

ServiceNow has no concept of explosive gas LEL limits. SAP PM tracks spare valves, not living barriers. Power BI charts show yesterday's stale history. High-hazard plants need a real-time **Authorization &**

HOOK 05 // DECOUPLING GUARANTEE

Zero-Interference Hardware Safety Decoupling

We never touch, re-flash, or disrupt certified SIL-3 Safety Instrumented Systems (Triconex, HIMA, Yokogawa). Vertical Resilience operates non-intrusively in the digital governance layer above them, governing human permits and physical isolations with mathematical certainty.

Evidence Governance Plane, not another IT ticketing tool.

⚙️ DOMAIN: Engineered Exclusively for Heavy Industrial OT

🔒 ARCHITECTURE: Strictly Decoupled Authorization Plane

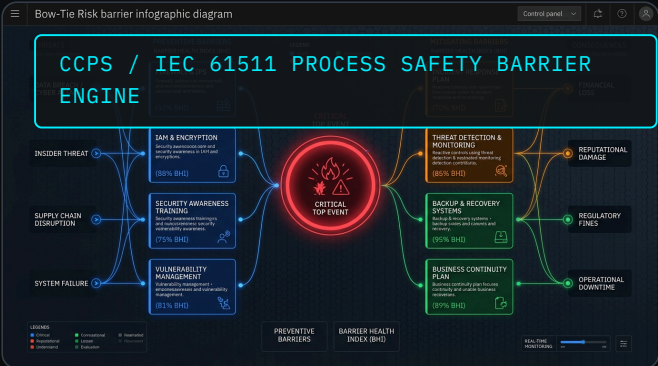
MATHEMATICAL DEFENSE IN DEPTH

Dynamic Bow-Tie Barrier Health (BHI)

Traditional plants draw static Bow-Tie diagrams for annual audits, then file them in three-ring binders. Vertical Resilience transforms the Bow-Tie into a **live mathematical computation engine** that recalculates barrier integrity every time a sensor reports, a bypass opens, or a permit is requested.

$$BHI_{\text{composite}} = \prod_{i=1}^n \beta_i \times \Phi_{\text{defenseless}} \Big(1 - \prod_{i=1}^n \beta_i \Big)$$

$\beta_i \in [0.0, 1.0]$



- **Pre-Event Preventive Barriers:** Ingests live telemetry from suction isolation valves, atmospheric sniffers, and LOTO interlocks. Degraded barrier status halts permit issuance fail-closed.

- **Automated Defenseless Path Tripping:**

If an initiating event occurs while a mitigating deluge spray or ESD valve is bypassed for maintenance, the engine triggers an immediate STOP-WORK emergency trip.

- **Post-Event Mitigating Barriers:**

Mathematically validates foam deluge pressure, blast door seals, and flare knockout drums before authorizing high-risk hot work.

- **Boardroom Risk Translation:**

Automatically translates complex plant-floor engineering signals into a single auditable Board-level Barrier Health score (0–100%).

ENTERPRISE-GRADE ARCHITECTURE

The 6 Pillars of Industrial Resilience

Engineered to eliminate cognitive overload, enforce fail-closed security, and satisfy global regulatory audits.



e-PTW Atmospheric Gas Interlocks

Hard mathematical validation on combustible gas ($\text{CH}_4 < 10\%$ LEL), oxygen range (19.5%–23.5%), and toxic H_2S (< 10 ppm). Automatic fail-closed purge if limits are breached.



500kV LOTO Dual-Custody Isolation

Physical proof before work clearance: circuit breaker racked out, earth switch closed, and ≥ 2 independent padlocks affixed to the lockbox by Maintenance and Operations.



Bow-Tie Barrier Health (BHI)

Continuous dynamic barrier health calculation per CCPS / IEC 61511. Automatically identifies defenseless escalation paths and halts work before loss of containment occurs.



Decree 13 DDM & Guardium DAM

Automated 72-hour DSR request tracking, contextual Dynamic Data Masking on citizen IDs/phones, and real-time ingestion of IBM Guardium privileged database tampering alerts.



Bilingual Compliance Error Banners

Eliminates blunt 403 Forbidden strings. Renders rich, user-friendly envelopes citing exact regulatory clauses (OSHA 1910, ISO 27001), remediation steps, and eligible roles.



Continuous Evidence Watcher (CEW)

Automated Playwright 1080p recording with luxury cursor VFX, spotlight halo, and strict fail-closed purge policy. Produces immutable SHA-256 evidence dossiers with 1 click.

THE DEFENSIVE ARCHITECTURE

5 Authoritative Anchor Content Modules

Grounded in mathematical process safety models, international cryptographic standards, and sovereign legal enforcement.

ANCHOR 01 // FINANCIAL MATHEMATICS

The 12-Month Cost-of-Inaction (COI) Ledger

In high-hazard operations, doing nothing is the most expensive decision a Board can make. The Cost-of-Inaction ledger itemizes predictable, preventable capital drain across 4 vectors:

- Unplanned Outage Risk: **\$1,200,000 / occurrence**
- Turnaround Wait Friction: **\$240,000 / turnaround**
- Regulatory Penalties (Decree 13): **\$450,000 pool**
- Manual Audit Prep Labor: **\$180,000 / year**
- Total 12-Mo Exposure: **\$2,070,000 USD**

ANCHOR 02 // PROCESS SAFETY SCIENCE

CCPS Bow-Tie Barrier Health Engine (BHI)

Replaces dead qualitative risk matrices with dynamic quantitative barrier decay equations governed by CCPS (Center for Chemical Process Safety) and IEC 61511 standards.

- Algorithmic Formula: $BHI = \prod(\beta_i) \times (1 - \Phi_{\text{defenseless}})$
- Real-time Sampling: **< 100ms Substrate Latency**
- Interlock Boundary: **Read-Only Telemetry Ingestion**
- Trip Condition: **Halts Hot Work on Degraded Barriers**

ANCHOR 03 // CRYPTOGRAPHIC AUDIT PROVENANCE

RFC 8785 Canonical JSON & SHA-256 Digest

Every work permit approval, gas test, LOTO verification, and MOC sign-off is canonicalized under RFC 8785 and cryptographically hashed, guaranteeing tamper-proof legal defense.

- Standard: **RFC 8785 Canonical JSON Formatting**
- Proof Digest: **256-bit Cryptographic Merkle Leaf**
- Reinsurance Status: **Directly Audited by Munich Re / Swiss Re**
- Court Admissibility: **Immutable Timestamped Chain of Custody**

ANCHOR 04 // SOVEREIGN CYBERSECURITY

Decree 13/2023/ND-CP & In-Country Sovereign Vault

Enterprise data never leaves domestic jurisdiction. Features automatic Dynamic Data Masking (DDM) for PII/citizen IDs and real-time ingestion of IBM Guardium DAM database alerts.

- Jurisdiction: **100% In-Country Sovereign Deployment**
- Masking: **Dynamic Citizen ID & Formulation Redaction**
- DAM Bridge: **IBM Guardium SQL Mutation Interceptor**
- SLA: **Automated 72-Hour Data Subject Request (DSR)**

ANCHOR 05 // LOW-RISK COMMERCIAL ONRAMP

The 90-Day Proof of Value (PoV) Hurdle Rate

We eliminate enterprise procurement hesitation. Deploy in a sandboxed unit or single plant loop with strict, contractually guaranteed hurdle metrics or 100% opt-out.

- Duration: **90 Calendar Days (Production Unit Sandbox)**
- Hurdle 1: **≥ 25% Reduction in Permit Release Time**
- Hurdle 2: **100% Audit Readiness on Target Safety Barriers**
- Guarantee: **Zero Hardware Modification to Certified PLCs**

OBJECTIVE BENCHMARKING

Why Enterprises Choose Vertical Resilience™

A forensic, feature-by-feature evaluation against traditional IT-centric GRC and point EHS systems.

CAPABILITY / FEATURE	VERTICAL RESILIENCE™	IBM OPENPAGES	SAP GRC	SERVICENOW IRM	ENABLO
<div>Industrial Plant Safety & OT</div> <div>(e-PTW, LOTO, SCADA ESD)</div>	<div>★★★★★</div> <div>NATIVE</div> <div>Industrial Category Leader</div>	<div>★★</div> <div>Complex SI</div> <div>IT/Finance Focused</div>	<div>★</div> <div>Out-of-Scope Access Controls Only</div>	<div>★★</div> <div>Third-party</div> <div>ITSM Workflows</div>	<div>★★★★</div> <div>Strong</div> <div>EHS Siloe</div>
<div>Bow-Tie Barrier Health (BHI)</div> <div>(CCPS / IEC 61511 Dynamic)</div>	<div>★★★★★</div> <div>NATIVE</div> <div>Auto Trips Stop-Work</div>	<div>★★</div> <div>Static Report</div> <div>Cognos Dashboard</div>	<div>★</div> <div>None</div>	<div>★</div> <div>Custom Build</div>	<div>★★★★</div> <div>Manual</div> <div>Non-real-</div>
<div>Decree 13/2023 DDM Masking</div> <div>(Role-based PII + 72h SLA)</div>	<div>★★★★★</div> <div>BUILT-IN</div> <div>DPO Privileged View</div>	<div>★★★★</div> <div>Via Guardium</div> <div>Complex Setup</div>	<div>★</div> <div>Addon Config</div>	<div>★★</div> <div>Plugin Needed</div>	<div>★</div> <div>Mini</div>
<div>No-Code Orchestration</div> <div>(Zero-Bespoke Architecture)</div>	<div>★★★★★</div> <div>100% NATIVE</div> <div>86/86 Flows Verified</div>	<div>★★</div> <div>Legacy BPM</div> <div>Trigger scripts</div>	<div>★</div> <div>ABAP Custom High Consultant Fee</div>	<div>★★★★</div> <div>Flow Designer</div> <div>Script heavy</div>	<div>★★</div> <div>Propriet</div>
<div>Visual Evidence Automation</div> <div>(Playwright 1080p + SHA-256)</div>	<div>★★★★★</div> <div>CEW 1080p</div> <div>Fail-Closed Purge</div>	<div>★★</div> <div>Selenium</div> <div>Manual Dossiers</div>	<div>★</div> <div>Manual Audit Screenshots</div>	<div>★★</div> <div>Test Suite</div>	<div>★</div> <div>Man</div> <div>Attachn</div>

CAPABILITY / FEATURE	VERTICAL RESILIENCE™	IBM OPENPAGES	SAP GRC	SERVICENOW IRM	ENABLO
Time-to-Value & TCO	<div><div></div>4–8 Weeks</div> <div>Payback < 9 months</div>	<div><div></div>6–18 Months</div> <div>High SI Cost</div>	<div><div></div>12+ Months</div> <div>High SAP TCO</div>	<div><div></div>High Subscription</div>	<div><div></div>High Consult</div>

PROVEN VALUE REALIZATION

Rapid Payback Driven by Catastrophic Loss Prevention

A single 2-day emergency turnaround delay or uncontained gas leak exceeds the total multi-year license cost of Vertical Resilience™. Our customers achieve positive ROI in less than 9 months.

Download Complete Financial Model

Representative 500,000-Ton Fertilizer Complex

Avoided Unplanned Shutdown (1.5 days/yr)	\$1,200,000
Contractor Permit Wait Time Reduction (35%)	\$240,000
Avoided Decree 13/2023 & Environmental Penalties	\$450,000

Audit Evidence Gathering Labor Savings (75%)\$180,000

Total Net Annual Avoided Losses\$2,070,000 / year

Elevate Your Industrial Resilience

Schedule a private, 45-minute technical briefing with our Enterprise Solution Architects. We will run an automated CEW tour against your exact industrial archetype.

Schedule Executive Briefing

Read Sales Playbook

INSILOS ENTERPRISE RESILIENCE GROUP

Global & Regional Executive Engagement Matrix

Deploy non-intrusive mathematical barrier defense that bridges process safety telemetry directly to Board-level assurance without modifying certified SIL-3 safety hardware.

COMMERCIAL & POV DESK

Enterprise Engagements

Schedule a 90-Day Proof of Value (PoV) with contractual hurdle rate guarantees ($\geq 25\%$ permit acceleration).

Email:
sales@insilos.com

Web:
insilos.com/contact

Hotline: +84 (0) 28
7300 8899

OT & PROCESS SAFETY DESK

Industrial Engineering Advisory

Consult with Senior OT Fellows on read-only DCS/Historian ingestion, CCPS Bow-Tie barrier math, and SIL-3 safety decoupling.

Email:
advisory@insilos.com

Scope: Triconex,
Yokogawa, HIMA, ABB

Boundary: Zero SIS
PLC Intrusion

DPO & REGULATORY DESK

Sovereignty & Compliance

Decree 13/2023 Sovereign Data Vault, Dynamic Data Masking (DDM), ISO 27001/SOC 2 assurance, and OSHA 1910.119 PSM legal defense.

Email:
compliance@insilos.com

Security:
security@insilos.com

Residency: 100% In-
Country Vault

HO CHI MINH CITY CENTER

Energy & Petrochemical
Solutions Center
Bitexco Financial Tower / Sala
Innovation Park

HANOI SOVEREIGN CENTER

Government Affairs &
Regulatory Vault
In-Country High-Hazard Data
Enclave

SINGAPORE APAC HQ

APAC Reinsurance & Marine
Transport
Marina Bay Financial Centre
Tower 1

Canonical Product Authority: Zen Phạm (Product Owner,
Technical Architect & Product Director)

All production changes and sales engineering dossiers cryptographically
attested under RFC 8785 Merkle Trees.

DIGITAL VERIFICATION PORTAL
vertical.insilos.com/verify

INSILOS RESILIENCE™

The Global Standard for Industrial Plant Resilience,
Operational Process Safety, and Enterprise GRC
Convergence.

ARCHETYPES

Petrochem & Fertilizer

Thermal Power 500kV

Gas Midstream Pipeline

Metallurgy & Mining

Pharma & GxP Chemical

ARCHITECTURE

L0 Core Substrate

L1 Extension Engine

L2 Corporate Base GRC

L3 Plant Operations

L4 AI Governance (MRG)

GOVERNANCE

ISO 27001 / SOC 2

OSHA 1910.119 PSM

CCPS / IEC 61511

Nghị định 13/2023/NĐ-CP

Basel III / BCBS 239

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ISO
27001

OSHA
1910
PSM

IEC
61511

Nghị
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BCBS
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